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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

WYROZEBSKI LEE, KATARZYNA I

ART UNIT

PAPER NUMBER

1796

MAIL DATE

DELIVERY MODE

09/29/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/553,868	Applicant(s) TAKAHASHI ET AL.	
	Examiner Katarzyna Wyrozebski	Art Unit 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/21/05;2/17/06;9/15/06;5/22/07</u> . | 6) <input type="checkbox"/> Other: ____. |

Claim Objections

1. Claim 9 is objected to because of the following informalities: Presence of parentheses and quotations is not proper. Appropriate correction is required.
2. Claim 7 is objected to because of the following informalities: With respect to the term “partially cyclic” compounds are either cyclic or not (based on solvents cited in the specification and claims). Appropriate correction is required.
3. Claim 4 is objected to because of the following informalities: Applicants are claiming polymer that has a repeating unit that at least partially contains a cyclic structure. It is not clear if the applicants are referring to the monomer or to the polymer. Appropriate correction is required, specifically grammar.
4. Claim 11 is objected to because of the following informalities: Applicants indicated that a process step comprises mixing of resin, solvent and nanofiber and then mixing the mixture in the solvent. Appropriate correction is required, specifically grammar.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 2, 4-15 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by JOHNSON (US 2006/0155043).

The prior art of JOHNSON discloses composite comprising nanostructures such as nanotubes and fibers. As specified in paragraph [0017] of JOHNSON the composition is utilized as coatings or composites having thermal and electrical properties.

Nanostructure – as defined in [0022] are utilized in amount of 0.01-50 wt %.

Nanostructures include SWNT, MWNT [0024-0025] as well as nanotubes formed from BN.

Diameter of the nanostructure is less than 1000 nm, and aspect ratio is greater than 100, preferably in a range of 10,000-50,000 [0027]. The purity of the nanotubes is at least 95 %, which signifies that the impurities are less than 5 % [0028]. Nanostructures in general are defined by JOHNSON as nanotubes, nanowires [0026]. Carbon nanotubes of JOHNSON as

Art Unit: 1796

indicated in [0051] are made with use of carbon monoxide, which is a vapor deposition type synthesis in a HFCVD.

Solvents – include dichloroethane, DMF, NMP, ethanol and propanol. NMP which is N-methylvinyl pyrrolidone satisfies applicants limitations [0031].

Polymers - as depicted in paragraphs [0032-0034] include polyolefins, polystyrene, PMMA, polycarbonate (example), polyimide, polyamides, and the like. Polymer content is 5-99.5 wt %.

Process of JOHNSON discloses making a dispersion (example 1) of nanotubes in organic solvent. Next a resin was dissolved in organic solvent/nanotube mixture to provide a dispersion where nanotubes content is 15-25 % by weight, Balance being solvent. Dispersion is deposited onto a substrate and subjected to heat to evaporate the solvent. The bundles were small with diameter of less than 30 nm. Claim 5 of JOHNSON also indicates that the dispersion comprising solvent, nanotubes and polymer are sonicated, which is a form of mixing.

In the light of the above disclosure, the prior art of JOHNSON anticipates claims rejected above.

7. Claims 1, 2, 4-15 are rejected under 35 U.S.C. 102(e) as being anticipated by CONNELL (US 2003/0158323) in view of evidence provided in JOHNSON.

CONNELL discloses composite comprising polymer and carbon nanotubes, wherein composite has good thermal and electrical properties.

Carbon nanotubes are preferred SWNT although MWNT are also encompassed. According to [0024] CNTs are prepared *via* chemical vapor deposition. Although the

Art Unit: 1796

dimensions and aspect ratio of SWNT of CONNELL is not disclosed, these are well known to one of ordinary skill in the art and are viewed as an intrinsic properties as evidenced in teachings of JOHNSON (see paragraph above). According to teachings CONNELL the CNT loading is in a range of 0.01-1.0 wt %. this signifies that the balance of the composition is polymer (the prior art of CONNELL does not teach any other additives)

Polymers – are disclosed in [0023 and 0027]. These include polyimides, polyarylene ethers and the like.

Solvents - are disclosed throughout examples and include DMF, toluene, DMAc, NMP and those not listed capable of dissolving polymer of choice. Toluene and NMP satisfy ET values of the instant invention.

Processes – there are several processes listed in paragraphs [0030-0041] and they all include forming a CNT dispersion in organic solvent. Polymer is added in two ways. One way is to dissolve already formed polymer within CNT dispersion and second, is to incorporate monomers into the dispersion and polymerize them *in situ*. Both methods are encompassed by the broad instant claims. In both cases the mixture of polymer/CNT/solvent are mixed and sonicated to break up the bundles. The composition is coated onto a substrate and solvent is evaporated. One of the articles includes coating, which by virtue will be deposited on some type of a substrate.

In the light of the above disclosure, the prior art of CONNELL anticipates claims rejected above.

Art Unit: 1796

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Art Unit: 1796

11. Claims 1, 2, 4-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over JOHNSON (US 2006/0155043).

The discussion of the disclosure of JOHNSON from paragraph 6 of this office action is incorporated here by reference. This prior art is restated also as obviousness rejection, not because it lacks any embodiments for anticipation, but because of the comparative examples cited therein. The prior art of JOHNSON also shows the same process as disclosed above applied to vapor grown carbon fibers. Although the prior art of JOHNSON discloses disadvantages of the process and properties achieved, the process itself is viewed as known in the art. The invention in itself does not have to better, but it has to be different.

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art to utilize discloses process of JOHNSON and thereby arrive at the instant invention. Specifically when the prior art of JOHNSON discloses mixing of vapor grown fiber with organic solvent and dissolving therein an organic polymer to arrive at a coating or composite having thermal and electrical properties.

12. Claims are rejected under 35 U.S.C. 103(a) as being unpatentable over JOHNSON (US 2006/0155043) or CONNELL (US 2003/0158323) either one of which in further view of NISHIMURA (US 6,489,026).

The discussion of the prior art of JOHNSON or CONNELL from paragraph 6, 7 or 11 is incorporated here by reference.

Art Unit: 1796

The difference between the present invention and the teachings of JOHNSON or CONNELL is recitation of boron content in the nanofiller, the content being up to 5 wt %.

The prior art of NISHIMURA discloses process of making vapor grown fibers that are nanofibers. NISHIMURA also discloses that these fibers can be hollow inside, which encompasses carbon nanotubes as well (CNTs fit the definition cited by the applicants).

The boron compound according to col. 5 of NISHIMURA can be present in crystal structure of the carbon nanofiber or as impurity. Bottom line it has to be present during crystallization. Boron content in the carbon fibers of NISHIMURA is in a range of 0.1-3 wt % based on the total weight of nanofibers (col. 6).

NISHIMURA teaches the issues of crystallization of such fillers without using heat. According to col. 5 of NISHIMURA addition of boron compound greatly improves crystallinity of the nanofillers such as nanofibers and which fibers have excellent electric properties.

The prior art of JOHNSON above discussed purity of carbon nanostructures and gave room to impurities or other components within the scope of the nanostructure as long as the amount of that component is less than 5 %.

In the light of the above disclosure having read and understood teachings of NISHIMURA, it would have been obvious to one having ordinary skill in the art to utilize boron containing carbon fibers or nanotubes in the teachings of JOHNSON or CONNELL and thereby arrive at the instant invention. Such modification would still allow one of ordinary skill in the art to produce a coating or other article that retains its electrical and thermal conductivity.

Art Unit: 1796

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katarzyna Wyrozebski whose telephone number is (571) 272-1127. The examiner can normally be reached on Mon-Thurs 8:30 AM-2:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on (571) 272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Katarzyna Wyrozebski/
Primary Examiner, Art Unit 1796
September 24, 2008